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IS 3917 (2003): Scoop Type Bed Material Samplers [WRD 1: Hydrometry]



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स्कूप टाइप बैड सामग्री — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard

SCOOP TYPE BED MATERIAL SAMPLERS —
SPECIFICATION
(*First Revision*)

ICS 17.120.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Fluid Flow Measurement Sectional Committee had been approved by the Water Resources Division Council.

Silt, sand, gravel and other insoluble materials transported by the streams as bed load, wash load and suspended load present problems of vital importance with regard to successful operation of many projects concerning flood control, soil conservation, irrigation, navigation, water-power development, etc. Therefore, to have adequate knowledge of the sediment load movement and of the determination of the particle size of bed material, a systematic sampling of the sediment at regular sampling station is highly desirable.

Different types of samplers like bed material samplers, bed load samplers, suspended sediment load samplers exist which vary widely in their design, principles of working and utility in the direct estimation of the relevant type of sediment load. Bed material samplers are used for collecting samples of the material, the particle size of which are found in appreciable quantities in the portion of the shifting bed of the stream.

The functional requirements of the bed material samplers are given in 3. Several types of samplers have been developed to cater for a number of these requirements. These samplers may be grouped as follows:

- a) Drag bucket type,
- b) Vertical pipe type,
- c) Grab type, and
- d) Scoop type.

In India, scoop type bed material sampler is most commonly used.

This standard was first published in 1966. In this revision, merits and demerits of scoop type bed material sampler have been added apart from affecting certain editorial changes and updating of references to the Indian Standards.

For other type of samplers for the bed materials, a reference may be made to IS 15360 : 2003 'Measurement of liquid flow in open channels — Bed material sampling' which is based on ISO 4364 : 1997 'Measurement of liquid flow in open channels — Bed material sampling'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SCOOP TYPE BED MATERIAL SAMPLERS — SPECIFICATION

(First Revision)

1 SCOPE

This standard specifies the functional requirements and performance tests of scoop type bed material samplers and materials to be used for its manufacture.

2 REFERENCES

The standards listed below contain provisions which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
1068 : 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium (<i>third revision</i>)
1239 (Part 1) : 1990	Mild steel tubes, tubulars and other wrought steel fittings: Part 1 Mild steel tubes (<i>fifth revision</i>)
1570 (Part 2/Sec1) : 1979	Schedules for wrought steels: Part 2 Carbon steels (unalloyed steels), Section 1 Wrought products (other than wires) with specified chemical composition and related properties (<i>first revision</i>)
1856 : 1977	Specification for steel wire ropes for haulage purposes (<i>second revision</i>)
13156 : 1991	Sheave pulley blocks for wire rope — Specification

3 FUNCTIONAL REQUIREMENTS

The functional requirements of an ideal bed material sampler are:

- The sampler should be stream-lined so as to reduce disturbance to the sediment flow;
- The sampler should be able to cut a layer of 8 cm to 10 cm thickness of the material present on the stream bed;
- The material cut should be so entrapped in the sampler that it remains intact, while the sampler is being raised from the bed to the water surface and unloaded into the container;
- The sampler should have arrangements for operation from the boat, bridge, etc; and

- The sampler should be capable of collecting bed material samples irrespective of the depth of bed.

4 GENERAL DESCRIPTION AND OPERATION

4.1 General

The scoop type bed material sampler has the following merits and demerits:

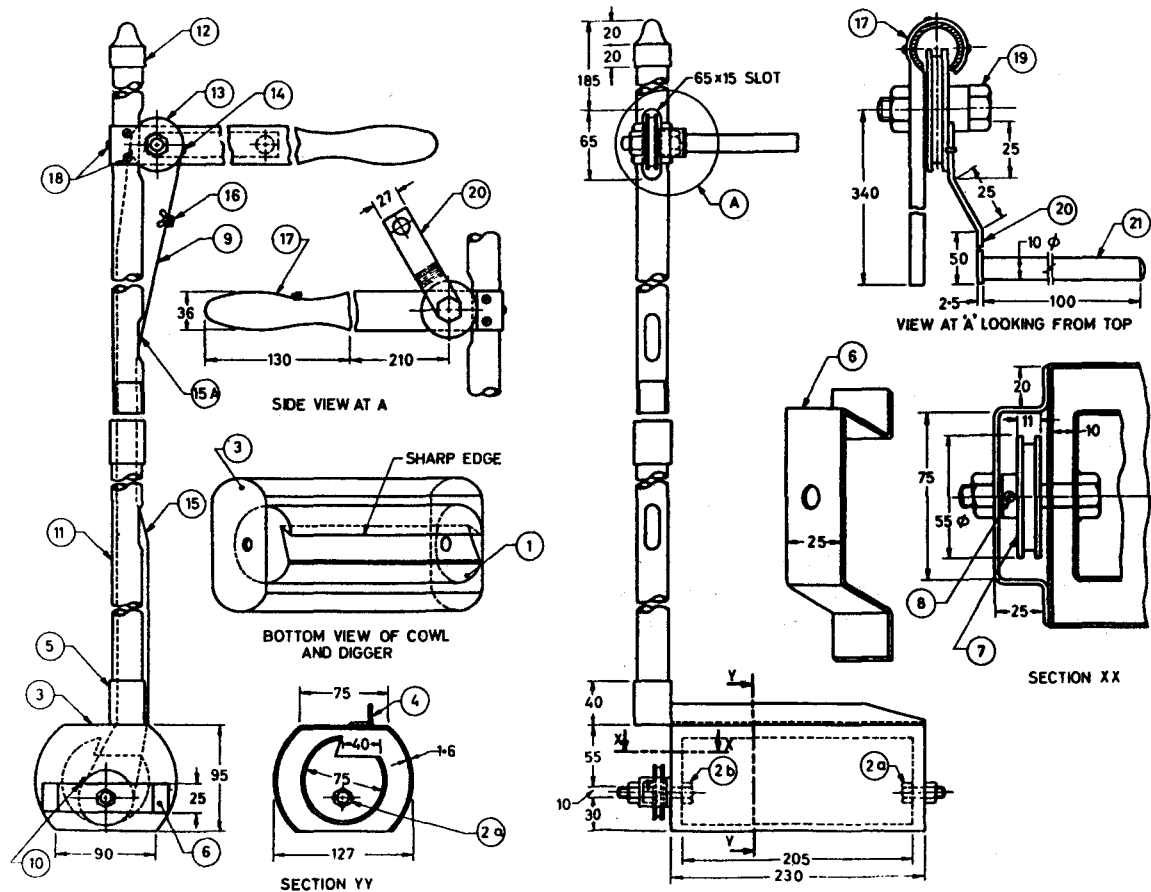
<i>Sl No.</i>	<i>Merits</i>	<i>Demerits</i>
i)	It is simple in design, construction and working	It creates undesirable disturbances near the bed of the stream for want of streamlined shape
ii)	It can be readily repaired at the spot without much difficulty	It can not be used for greater depths
iii)	It can be operated by one or two observers without the help of any intricate mechanical device and normally up to a depth of 5 m	

4.2 Description

The scoop type bed material sampler shall consist of the following main parts:

- The scoop (or digger) and cowl,
- Pulleys and stranded flexible wire,
- Pipe arrangement, and
- Upper clamp and handle arrangements.

4.2.1 The principal parts of the sampler are shown in Fig. 1. The eccentrically mounted scoop which revolves inside the cowl shall have a sharp front edge which shall project slightly out of the cowl in the fully opened condition. The scoop shall be connected to a pulley and flexible wire arrangement at the lower end outside the cowl. At the pulley end of the cowl a pipe shall be welded to it through which the flexible wire shall pass. Pieces of pipes maybe joined together with



Sl No.	Description
1	Scoop or digger
2a	Bolts
2b	
3	Cowl
4	Angle iron
5	Socket
6	Lower clamp
7	Lower pulley 55 mm dia aprox
8	Screw for fixing pulley
9	Stranded flexible wire rope
10	Screw for fixing stranded wire rope
11	GI pipe

Sl No.	Description
12	Car
13	Upper pulley 55 mm dia
14	Screw for fixing stranded wire rope to upper pulley
15	Lover slot
15A	Upper slot
16	Fly nut screw
17	Upper clamp
18	Screw for fixing clamp with GI pipe
19	10 mm dia bolt
20	Handle
21	Steel Rod

All dimensions in millimetres.

FIG. 1 DETAILS OF SCOOP TYPE BED MATERIAL SAMPLER

threaded sockets to make up the required length. The other end of the flexible wire shall pass through a second pulley. The rotation of the handle shall move the pulleys which in turn rotate the scoop so that the opened mouth turns up inside the cowl.

4.3 Details of Assembly

4.3.1 General

Details of various parts of scoop type bed material sampler are shown in Fig. 1.

4.3.2 Scoop and Cowl

4.3.2.1 Scoop

The scoop or digger (1) shall be approximately 1.6 mm thick, 75 mm diameter, 200 mm long hollow cylinder. The cylinder should be cut throughout its length so as to have an opening of sufficient size (approximately 40 mm) width and of the shape as shown in Fig. 1. One edge of this opening shall be sharpened for cutting the bed material. Two eccentric holes along the same

horizontal axis should be made in the two end sides of the scoop cylinder to fit it through two bolts (2a, 2b) passed through these holes to the cowl (3), the head of the bolts being welded to the side of the scoop as shown in Fig. 1 and the other end secured by a nut from outside the cowl, in such a way that the bolt can rotate inside the cowl hole.

4.3.2.2 Cowl

The cowl (3) which forms the outer cover of the scoop (1) in which the latter is eccentrically mounted and rotates, shall be approximately 1.6 mm thick hollow cylinder 230 mm long, 125 mm diameter, having flattened top and bottom. The flattened base shall be cut to have sufficient opening (approximately 90 mm) along the entire length of the cylinder. On the top flattened surface (approximately 75 mm width) an angle iron (4) shall be welded. The pulley end of this angle iron (4) shall be welded to a pipe socket (5) to which a pipe (11) shall be attached. Two eccentric holes along the same horizontal axis of the cowl shall be made in its two sides corresponding to the holes made on the sides of the scoop cylinder.

4.3.3 Pulleys, Pulley Clamp and Stranded Flexible Wire

To the pulley end side of the cowl of a clamp (6) of the shape shown in Fig. 1 shall be welded. Its ends shall be bent into two inverse right angles. The two protruding ends shall be welded to the pulley end side of the cowl. In the central portion of this clamp a hole concentric to the one in cowl and scoop shall be made through which the bolt (2b) having its head welded inside the scoop shall pass. To this bolt a steel pulley (7) of about 50 mm diameter with a flange shall be rigidly fixed through a screw (8), on the outside of the cowl (3) and inside the clamp (6), so that it moves with the bolt (2b). This bolt (2b) shall then be tightly secured by a nut fixed to the outside of the clamp (6) in such a way that this bolt (2b) shall be free to rotate inside cowl (3) and clamp (6) hole with scoop (1) and pulley (7). To the other end of the scoop, head of a similar bolt (2a) shall be welded and the bolt then passed through the concentric hole made in the cowl and secured by a nut to it so that the scoop can rotate freely inside the cowl on these two holes (2a) and (2b). In the middle portion of pulley (7) grooves, a flexible wire rope (9) of required length shall be securely fixed by a screw (10) in such a way that when this wire rope is pulled, pulley and scoop rotate simultaneously. This wire rope shall be attached to the upper pulley in such a way that while passing over the grooves of lower and upper pulley it forms a belt, which is rotated through a handle fixed to the upper pulley.

4.3.4 Pipe Arrangement (11)

A pipe of suitable size approximately 19 mm and 25 mm internal and external diameter respectively, having grooves at both ends shall be fixed to the pipe socket (5) welded to the angle iron (4) which itself is welded to the upper surface of the cowl (3). Separate pipe pieces preferably each of 2 m length shall be added to this pipe (11) to make the required length of the sampler through pipe sockets. Through these pipes the flexible wire rope (9) should be passed in such a way that one portion of wire rope runs through the pipes and the other portion partly inside and partly outside the pipes. For this purpose at intervals of 1 m length of each pipe, a slot should be cut. In the top most pipe another slot of suitable dimensions (approximately 65 mm long and 15 mm wide) shall also be cut (about 185 mm) below the cap of the pipe (12) upper pulley (13) and handle arrangements shall be fixed to this top slot. The wire rope (9) shall be securely fixed by a screw (10) to the centre of the groove of the lower pulley (7) in such a way that its one side runs through the pipes and shall then be securely fixed by a screw (14) to the centre of the groove of the upper pulley. The other side of the wire rope after passing over the lower pulley shall be carried outside the pipe up to its lower slot (15). It shall then be carried inside the pipe through the slot (15) up to the slot (15A) of the upper pipe and shall then be taken out. It shall be so arranged that its upper most end after coming out of the upper slot shall be fixed to the other end of the wire rope. For fixing these two ends, loops may be made in each end and joined together through a fly nut screw (16), so that the tension in the wire rope can be adjusted. This wire rope should pass over the two pulleys so as to rotate the scoop (1) by handle attached to upper pulley (13).

4.3.4.1 A cap (12) shall be fixed to the upper most end of the pipe.

4.3.5 Upper Clamp and Handle Arrangement

This part shall have two essential components as follows:

- a) Upper clamp to which the upper pulley and handle should be attached, and
- b) Handle.

4.3.5.1 Upper clamp (17)

The arm of the upper clamp shall be sufficiently long (420 mm) and of approximately 35 mm wide and 7 mm thick metallic plate of the shape shown in Fig. 1. One end of it shall be clamp (17) shall then be screwed to the pipe through screws (18), in such a way that the upper pulley can freely rotate in the upper slot. At a suitable length (approximately 340 mm) from the other end of this arm, a hole for bolt (say 10 mm diameter)

shall be made. A bolt (19) should pass through bent to form a grip over the pipe in such a way that upper most slot width is not covered. On this bolt a pulley (13) of approximately 55 mm diameter with a protruding flange shall be mounted. To the other end of this bolt (19) a nut shall be properly screwed in such a way that the upper pulley can freely rotate on the bolt (19).

4.3.5.2 Handle

A handle (20) shall be fixed to this upper pulley. This handle should be bent into an elbow shape, one end of which should be riveted to the upper pulley. A steel rod (21) shall be fixed to the other end at right angles to take the handle (20). With the rotation of this handle, pulley shall also rotate and through the wire rope the lower pulley and scoop will also rotate. With a view to facilitating easy operation when the handle is above the reach, a string may be tied onto the handle of the sampler.

4.4 Operation

The sampler, with the mouth of the scoop open shall be lowered to the bed of the stream and allowed to rest on the bed in this open condition. The handle connected with the top pulley shall be rotated from the boat or bridge which in turn moves the flexible wire and the lower pulley connected with the scoop. The scoop on rotation digs or grabs the sample from the bed of stream. The sample shall be collected inside the scoop and the cowl shall protect the sample from being washed away while the sampler is brought to the surface.

5 MATERIALS

5.1 General

Typical examples of materials to be used for different components are given in 5.2 to 5.5 and this does not preclude the use of alternative materials having characteristics equivalent to or superior to those specified.

5.2 Scoop and Cowl

The scoop and cowl should be preferably of 45C8 or 50C8 steel conforming to IS 1570 (Part 2/Sec 1) with nickel coating in accordance with IS 1068 or a suitable material of equivalent hardness and rust proof.

5.3 Pulleys

The pulleys should of rust proof material and should preferably conform to IS 13156.

5.4 Stranded Flexible Wire

Steel wire ropes used should preferably conform to IS 1856.

5.5 Pipes

Pipes should be of rust proof material. Galvanized iron pipes should be conforming to IS 1239 (Part 1). The pipes should suitably painted.

6 TESTS FOR PERFORMANCE

The sampler shall satisfy the following tests:

- a) In a single scoop it should be able to scoop about 8 to 10 cm depth of the bed layer within the specified range of depth and velocity, namely, 5 m and 3 m/s respectively;
- b) The scoop should be practically full (at least to 90 percent) when it is taken out; and
- c) The deflection in the pipe due to bending while the final assembly of the sampler operates at the specified maximum depth and velocity, that is, 5 m and 3 m/s respectively, shall not be more than 2 cm, and should be such that the operator does not feel any difficulty due to the deflection.

7 MARKING

7.1 Each sampler shall prominently show the name of the manufacturer, year of manufacture, etc, in the upper clamp. A certificate from a well equipped laboratory showing the details of the tests carried out as specified in 6 shall be made available to the purchaser on demand.

7.1.1 BIS Certification Marking

The product may also be marked with the Standard Mark

7.1.1.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. Details of conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

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AIMIL Private Ltd, New Delhi

Bhakra Beas Management Board, Punjab

Central Water and Power Research Station, Pune

Central Water Commission, New Delhi

Consulting Engineering Services (INDIA) Private Ltd, New Delhi

Electronic Equipments, Pune

Fluid Control Research Institute, Palghat (Kerala)

Indian Institute of Science, Bangalore

Indian Institute of Technology (Department of Civil Engineering),
Roorkee

Irrigation Department, Government of Andhra Pradesh, Hyderabad

Irrigation Department, Government of Karnataka, Sagar

Irrigation Department, Government of Punjab, Amritsar

Irrigation Department, Government of Uttar Pradesh, Lucknow

Ministry of Railways (RDSO), Lucknow

National Hydroelectric Power Corporation Ltd, Faridabad

National Institute of Hydrology, Roorkee

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 0131, 2323 33 75, 2323 9402

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 2323 7617 2323 3841
Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700 054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022	{ 60 3843 60 9285
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